The U.S. Department of Energy's (DOE) Federal Energy Management Program (FEMP) facilitates the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

PURCHASING SPECIFICATIONS FOR ENERGY-EFFICIENT PRODUCTS

Whole-Home Gas Tankless Water Heaters

Legal Authorities

Federal agencies are required by the National Energy Conservation Policy Act (P.L. 95-619), Executive Order 13423, and Federal Acquisition Regulations (FAR) Subpart 23.2 and 53.223 to specify and buy ENERGY STAR®-qualified products or, in categories not included in the ENERGY STAR program, FEMP-designated products. FEMP-designated products are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirement for Federal Purchases		
Water Heater Fuel & Type	**Energy Factor (EF)[a]**	**Annual Energy Use[b]**
Gas, Whole Home, Tankless	0.82 or higher	183 therms[c]/year or less

a) EF is the ratio of the energy supplied in heated water divided by the energy input to the water heater.
b) Based on DOE test procedure (10 CFR 430, Sub-Part B, Appendix E).
c) 1 therm = 100,000 British Thermal Units (Btu).

Buying Energy-Efficient Whole-Home Gas Tankless Water Heaters

This *Specification* applies to whole-home, gas, tankless water heaters with nominal inputs from 50,000 to 200,000 British thermal units per hour (Btuh), a minimum flow rate of 2.5 gallons per minute (gpm) with a 77ºF temperature rise, and storage capacity of two gallons or less. The Federal supply sources for gas water heaters are the General Services Administration (GSA) and the Defense Logistics Agency (DLA). GSA sells water heaters through its Multiple Awards Schedule program and online shopping network, *GSA Advantage!* DLA offers them through the Defense Supply Center Philadelphia and online through DLA E-Mall. When purchasing gas tankless water heaters, specify or select models that are ENERGY STAR-qualified, all of which meet the *Performance Requirements* shown above. A list of qualified products is available on the ENERGY STAR Web site.

These requirements apply to all forms of procurements, including: guide and project specifications; construction, renovation, repair, energy service, operation and maintenance (O&M) contracts; lease agreements and solicitations for offers. Energy performance requirements should be included in all evaluations of solicitation responses. Buyers shall insert the standard clause from FAR section 52.223-15 into contracts and solicitations that deliver, acquire, furnish, or specify energy consuming products for use in Federal facilities. Agencies can claim an exception to these requirements through a written finding that no ENERGY STAR-qualified or FEMP-designated product is life cycle cost-effective for a specific application.

Buyer Tips

Tankless water heaters (also called demand-type or instantaneous) heat water as it is needed. When an application (i.e., faucet, showerhead, clothes washer) is turned on, the flow of water activates the burner. For some products, a minimum flow of one-half gallon per minute (gpm) is needed to activate the burner. If the water flow is below this level, hot water will not be provided. When installing tankless water heaters, make sure the minimum flow of each application is sufficient to activate the burner.

Ground water temperature will have an impact on the performance of tankless water heaters. A very low inlet temperature can reduce the amount of hot water delivered. Tankless water heaters are limited in the number of applications they can satisfy simultaneously. The largest tankless water heaters available provide around five gpm. While this is enough hot water for several low-flow applications (i.e., bathroom faucets) or a couple moderate-flow applications (i.e., a shower and clothes washer), it is unlikely tankless water heaters could satisfy two high-flow applications (i.e., tub spigot, multi-head shower) at the same time.

The installation requirements for gas tankless water heaters are slightly different from storage type. The burners on gas tankless water heaters can have outputs as high as 200,000 Btuh while the burners in storage type water heaters have outputs of 75,000 Btuh or less. The supply line must be sized to provide enough gas for the larger burners. The venting requirements for gas tankless water heaters are different as well, especially for the most efficient products. Due to the low exhaust gas temperature

For More Information:

Federal Energy Management Program
(202) 586-5772
www.femp.energy.gov/procurement/

Lawrence Berkeley Laboratory provided product research and life cycle cost analysis in support of this specification.
(202) 488-2250

EPA/DOE ENERGY STAR
(888) 782-7937
www.energystar.gov/

Air Conditioning, Heating and Refirgeration Institute (AHRI) has the *Directory of Certified Product Performance,* online at:
www.ahrinet.org/

NIST publishes *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis – 2009 Annual Supplement to NIST Handbook 135 and NBS Special Publication 709* (NISTIR 85-3273-24, Rev. 5/09). This document is online at:
www1.eere.energy.gov/femp/pdfs/ashb09.pdf

Federal Supply Sources:

General Services Administration
(816) 926-6760
www.gsa.gov/
www.gsaadvantage.gov/

Defense Logistics Agency
(Access to DLA's Web sites requires enhanced security measures. Civilian Federal agencies may have difficulty accessing these sites.)
www.dla.mil/
dod-emall.dla.mil

Defense Supply Center Philadelphia
(800) DLA-BULB
www.dscp.dla.mil/

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and condensation that occurs as a result of efficiency improvements, corrosive-resistance materials are needed for the vent. The vents are typically run horizontally through walls instead of vertically through roofs and are limited to about 10 linear feet. Tankless water heaters must be connected to drain lines in order to dispose of the condensate.

Annual maintenance must be evaluated when considering tankless products, especially in areas with hard water. Consult with a reputable local installer who has experience with tankless water heaters to determine the proper unit, sizing, installation, and maintenance requirements for your particular situation.

User Tips

Energy costs increase with temperature. Dishwashers require the hottest water of all household uses, typically 135 to 140ºF. However, dishwashers are usually equipped with booster heaters that raise the incoming water temperature by 15 to 20ºF. Setting the water heater between 120 and 125ºF and turning the dishwasher's booster on should provide sufficiently hot water while saving energy and reducing the chances for scalding.

Cost-Effectiveness Example

Performance	Base Model[a]	Required	Best Available[b]
Energy Factor (EF)	0.80	0.82	0.98
Annual Energy Use[c] (therms/year)	204	199	166
Annual Energy Cost	$204	$199	$166
Lifetime Energy Cost	$3,255	$3,175	$2,650
Lifetime Energy Cost Savings	**—**	**$80**	**$605**

a) The EF of the *Base Model* is based on the current typical minimum EF of tankless water heaters available. Assumed 180,000 Btuh input, recovery efficiency of 80 percent and no pilot light.
b) Performance data for the *Best Available* model is from the AHRI directory of residential water heaters. More efficient products may have been introduced to the market since this *Specification* was published.
c) Includes Performance Adjustment Factor of 8.8 percent.

Cost-Effectiveness Assumptions

In the example above, the *Annual Energy Use* is based on the standard DOE test procedure and calculated assuming an inlet water temperature of 58ºF, a setpoint of 135ºF, daily hot water demand of 64 gallons, and 365 days per year of use. The assumed price for natural gas is $1.00 per therm, the average at Federal facilities in the U.S. *Lifetime Energy Cost* is the sum of the discounted value of the *Annual Energy Cost* based on average usage and an assumed water heater life of 20 years. Future natural gas price trends and a discount rate of 3.0 percent are from National Institute of Standards and Technology (NIST) guidelines.

Using the Cost-Effectiveness Example

In the example above, the *Required* water heater is effective if its installed cost is no more than $80 above the *Base Model*. Since there is little cost difference between the *Base* and *Required* models, these products will almost always be cost effective. The *Best Available* model, which is a condensing tankless water heater, is effective if its installed cost is no more than $605 above the *Base Model*.

What if My Energy Price is Different?

FEMP provides a Web-based cost calculator for water heaters at *www1.eere.energy.gov/femp/technologies/eep_waterheaters_calc.html* that allows users to input different rates for natural gas, as well as values for Energy Factor and Recovery Efficiency. The output section displays results that better reflect your energy usage and costs.

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

For additional information please contact:
EERE Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov/informationcenter

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